

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently amended): A method of compressing ~~shapevector~~ data which indicate position information on a digital map and which have a shape represented by a coordinate point series, the method ~~being characterized by comprising the~~ steps of:

~~samplingresampling~~ a vector shape by a constant ~~samplingresampling~~ length in such a manner that a distance error between a straight line which links between sampling points and the vector shape does not deviate to either the left or the right of the straight line in a longitudinal direction thereof so as to set a sampling point;

representing the vector shape by a data string of angle information indicating the position of the sampling point; and
variable length coding data of the data string.

Claim 2 (Currently amended): The method of compressing ~~shapevector~~ data according to Claim 1, ~~wherein characterized in that:~~

when setting the sampling point, the sampling point is set in consideration of a difference between an area located between

the straight line and the vector shape on the right side of the straight line and an area located between the straight line and the vector shape on the left side of the straight line.

Claim 3 (Currently amended): The method of compressing ~~shape~~vector data according to Claim 1, ~~wherein~~characterized in that:

when setting the sampling point, the sampling point is set in consideration of a difference between the length of a line segment of the vector shape located on the right side of the straight line and the length of a line segment of the vector shape located on the left side of the straight line.

Claim 4 (Currently amended): The method of compressing ~~vector~~shape data according to Claim 1, ~~wherein~~characterized in that:

when setting the sampling point, the sampling point is set in consideration of a difference between a maximum distance error between the straight line and the vector shape on the right side of the straight line and a maximum distance error between the straight line and the vector shape on the left side of the straight line.

Claim 5 (Currently amended): The method of compressing ~~shape~~vector data according to Claim 1, ~~characterized in that~~wherein:

when setting the sampling point, the sampling point is set in consideration of a larger maximum distance error out of a maximum distance error between the straight line and the vector shape on the right side of the straight line and a maximum distance error between the straight line and the vector shape on the left side of the straight line.

Claim 6 (Currently amended): The method of compressing ~~vector~~shape data according to Claim 1, ~~characterized in that~~wherein:

when setting the sampling point, the sampling point is set in consideration of a ~~deviation~~deflection angle absolute value of the straight line.

Claim 7 (Currently amended): An information providing apparatus for providing data containing position information on a digital map, ~~the apparatus being characterized by~~ comprising:

shape data extracting means for extracting ~~road~~ shape data of an object road from a digital map database;

shape data ~~resample~~sample processing means for ~~resamplingsampling~~ the ~~road~~-shape data by a constant ~~resamplingsampling~~ length in such a manner that a distance error

between a straight line which links between sampling points and the ~~road~~-shape data does not deviate to either the left or the right of the straight line so as to set a sampling point and representing the object road by a data string of quantized angle information which indicates the position of the sampling point;

variable length coding means for variable length coding data of the data string; and

providing means for providing means for providing data coded by the variable length coding means.

Claim 8 (Currently amended): A probe car on-board apparatus for providing information on a traveling path, ~~being characterized by the apparatus~~ comprising:

own vehicle position detecting means for detecting a position of an own vehicle;

storing means for storing sequentially the positions of the own vehicle detected by the own vehicle position detecting means as a traveling path;

shape data ~~resample~~sample processing means for ~~resamplingsampling~~ the traveling path by a constant ~~resamplingsampling~~ length in such a manner that a distance error between a straight line which links between sampling points and the traveling path does not deviate to either the left or the right of the straight line so as to set a sampling point and representing the traveling path by a data string of quantized

angle information which indicates the position of the sampling point;

variable length coding means for variable length coding data of the data string; and

transmitting means for transmitting data coded by the variable length coding means.

Claim 9 (Currently amended): A method of compressing position information on a digital map, ~~being characterized by the method~~ comprising the steps of:

changing an angle resolution which constitutes a quantization unit of an angle depending on a length of a ~~resampling~~sampling length ~~which regulates an interval of resampling;~~

dividing a linear shape contained in a digital map into one or a plurality of segments and ~~resampling~~sampling linear shapes in the segments by a constant ~~resampling~~sampling length;

representing the position of the linear shape by a data string of quantized angle information indicating the position of a sampling point; and

variable length coding data of the data string.

Claim 10 (Currently amended): A compressing method as set forth in Claim 9, ~~characterized in that~~wherein:

when setting the angle resolution, the magnitude of the angle resolution is set large when the ~~resampling~~sampling length is short.

Claim 11 (Currently amended): The compressing method according to Claim 9, ~~characterized in that~~wherein:

when setting the angle resolution, the ~~resampling~~sampling length or the angle resolution is set such that a distance error between the linear shape and a ~~resampling~~sampling shape does not exceed a permissible error that has been regulated in advance.

Claim 12 (Currently amended): The compressing method according to Claim 10, ~~characterized by comprising further~~ comprising the step of:

setting an upper limit on the angle resolution.

Claim 13 (Currently amended): The compressing method according to Claim 9, ~~characterized in that~~wherein:

when setting the angle resolution, the magnitude of the angle resolution is changed according to the magnitude of an absolute value of a ~~deviation~~deflection angle, so that the angle resolution when the absolute value of the ~~deviation~~deflection angle is small is set small.

Claim 14 (Currently amended): The compressing method according to Claim 9, ~~characterized in that~~wherein:

when ~~resamplingsampling~~ the linear shape,

a plurality of candidate points are set at positions which are away by the ~~resamplingsampling~~ length from a adjacent sampling point in respective directions that the quantized angle can take; and

of the candidate points, the candidate point which approximates to the linear shape most truly is set as a sampling point.

Claim 15 (Currently amended): An information providing apparatus for providing position information on a digital map, ~~being characterized by~~the apparatus comprising:

angle resolution determination means for setting an angle resolution which constitutes a quantization unit of an angle according to a length of a ~~resamplingsampling~~ length ~~which regulates an interval of resampling~~;

shape data ~~resamplingsampling~~ processing means for dividing the road shape of an object road contained in a digital map into one or a plurality of segments, ~~resamplingsampling~~ road-shapes in the segments using a constant ~~resamplingsampling~~ length and an angle resolution set according to the length of the ~~resamplingsampling~~ length and producing a data string of

quantized angle information indicating a position of a sampling point; and

variable length coding means for variable length coding data of the data string; and ~~characterized in that~~wherein, data coded by the variable length coding means are provided as position information of the object road.

Claim 16 (Currently amended): A probe car on-board apparatus for providing information on a traveling path, ~~being characterized by~~the apparatus comprising:

own vehicle position determination means for detecting a position of an own vehicle;

storing means for storing a traveling path;

~~resamplingsampling~~ length and angle resolution determination means for determining a ~~resamplingsampling~~ length ~~which regulates an interval of resampling~~ based on the shape of the traveling path or information of a sensor installed in a vehicle and determining an angle resolution which constitutes a quantization unit of an angle according to the length of the ~~resamplingsampling~~ length;

traveling path ~~resample~~sample processing means for ~~resamplingsampling~~ the traveling path using the ~~resamplingsampling~~ length and the angle resolution which are determined by the ~~resamplingsampling~~ length and angle resolution determination means and producing a data string of quantized

angle information indicating the position of a sampling point;
and

a variable length coding means for variable length coding
data of the data string, and ~~characterized in that~~wherein;

data coded by the variable length coding means are provided
as information on the traveling path.

Claim 17 (Currently amended): A computer readable recording
medium storing a program for executing the compression of
~~vector shape~~ data indicating position information on a digital
map, ~~being characterized in that~~wherein:

a computer is made to execute;

~~resampling~~sampling a vector shape by a constant
~~resampling~~sampling length in such a manner that a distance error
between a straight line which links between sampling points and
the vector shape does not deviate to either the left or the
right of the straight line in a longitudinal direction thereof
so as to set a sampling point;

representing the vector shape by a data string of angle
information indicating the position of the sampling point; and
variable length coding data of the data string.

Claim 18 (Currently amended): A computer readable recording
medium storing a program for executing the compression of

position information on a digital map, ~~being characterized in that~~wherein:

a computer is made to execute;

setting an angle resolution which constitutes a quantization unit of an angle according to a ~~resampling~~sampling length ~~which regulates an interval of resampling;~~

dividing a linear shape contained in a digital map into one or a plurality of segments and ~~resampling~~sampling linear shapes in the segments by a constant ~~resampling~~sampling length;

representing the position of the linear shape by a data string of quantized angle information indicating the position of a sampling point; and

variable length coding data of the data string.

Claim 19 (Currently amended): A method of compressing position information on a digital map, ~~being characterized by comprising~~ the steps of:

~~resampling~~sampling an object road segment by a constant ~~resampling~~sampling length in such a manner that a distance error between a straight line which links between sampling points in the object road segment and the object road segment does not deviate to either the left or the right of the straight line in a longitudinal direction thereof so as to set a sampling point;

representing the object road segment by a data string of angle information indicating the position of the sampling point; and

variable length coding data of the data string.

Claim 20 (Currently amended): A method for compressing position information on a digital map, ~~being characterized by comprising~~ the steps of:

setting an angle resolution which constitutes a quantization unit of an angle according to the length of a ~~resamplingsampling~~ length ~~which regulates an interval of resampling;~~

dividing a road contained in a digital map into one or a plurality of segments and ~~resamplingsampling~~ the segments by a constant ~~resamplingsampling~~ length;

representing the position of the segments by a data string of quantized angle information indicating the position of a sampling point; and

variable length coding data of the data string.

Claim 21 (Currently amended): The compressing method according to Claim 11, ~~characterized by comprising further~~ comprising the step of:

setting an upper limit on the angle resolution.

Claim 22 (New): A receiver that receives data which is compressed by a method according to claim 1.

Claim 23 (New): A receiver that receives data which is compressed by a method according to claim 9.

Claim 24 (New): A receiver that receives data which is compressed by a method according to claim 19.

Claim 25 (New): A receiver that receives data which is compressed by a method according to claim 20.